
Space Weather Technical Forecast

Issued on Wednesday, 10 July 2024 at 01:26 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Chance of M-class flares (R1-R2; Minor-Moderate radio blackouts) throughout. Chance of G1/Minor Storm intervals days 3 & 4 (12-13 Jul).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity is Low with baseline and peak X-ray flux all contained within C-class over the past 24hrs. There are seven numbered and five as yet unnumbered regions on the disc. AR3738 in the southeast is by far the largest and most complex region on the disc, showing a continued growth trend in penumbral area and beta-gamma magnetic configuration. AR3743 also in the southeast but closer to the limb, is showing a slight growth trend in penumbral extent but appears relatively simple. There are four as yet unnumbered regions near the eastern limb, all of which appear simple, with the rest of the numbered and unnumbered regions on the disk also appearing small and magnetically simple.

A CME was spotted leaving the Sun near south centre disk around 10/0530 UTC, associated with a C-class flare, though this appears to be very slow and is unlikely to arrive at Earth. Therefore, no Earth-directed CMEs have been observed during the past 24 hours.

Solar Wind / Geomagnetic Activity: Solar winds as observed by ACE at L1 were indicative of background conditions. Speeds were slow-ambient around 350-400 km/s. Density was below average. The Interplanetary Magnetic Field, Bt, was weak, below 7nT. The north-south component, Bz, varied weakly between +5/-4nT. The phi angle was variable but mostly negative (toward the Sun). The resulting geomagnetic activity was Quiet (Kp 1-2).

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux observed by GOES18 remained at background levels. High energy electron flux (greater than 2MeV) observed by GOES16 was at mostly background levels. The 24-hour fluence was below Active, with 1.96e6 integrated pfu observed at 10/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be at Low, with a chance of becoming Moderate, with a chance of isolated M-class flares.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs feature in the forecast. The solar wind should start at slow-ambient levels, rising to Slightly Elevated or perhaps briefly Elevated speeds later on day 1 until early day 3 (10-12 Jul) due to two negative polarity CH HSS. Day 3 or on day 4 (12-13 Jul) a further, likely faster and perhaps more impactful CH HSS is expected to arrive bringing Elevated solar wind speeds.

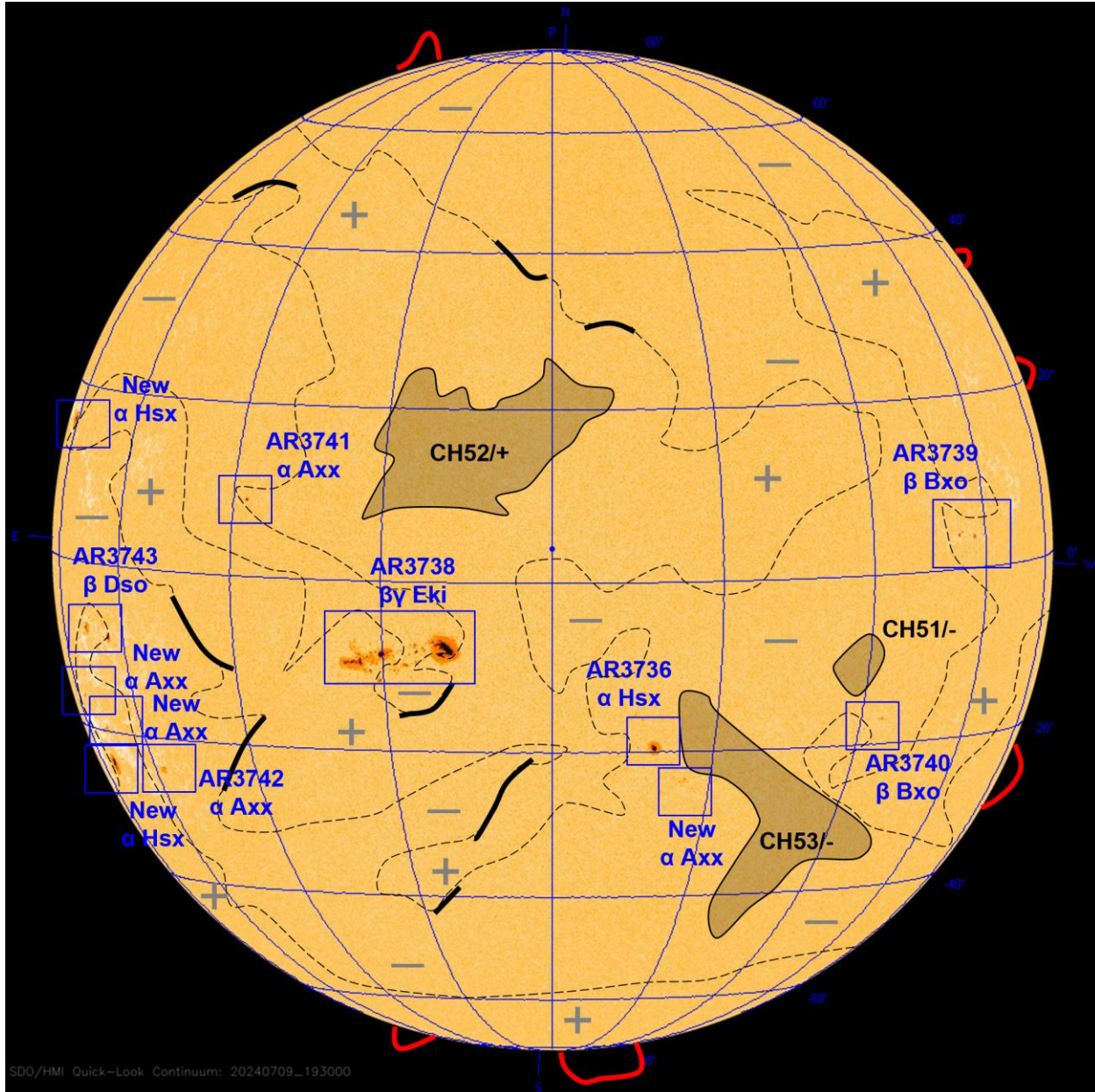
Geomagnetic activity is expected to be mainly Quiet to Unsettled through the period. There is a Slight Chance of G1/Minor storm intervals days 1-2 (10-11 Jul), this then increasing to a Chance by days 3 and 4 (12-13 Jul) due to successive coronal hole fast wind enhancements.

Energetic Particles / Solar Radiation: Solar radiation storms are not expected, but there is a very slight chance of reaching S1/Minor Radiation Storm or greater levels. This risk increases a little later in the period as AR3738, currently in the southeast, rotates towards centre disc and into a more geoeffective position.

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High energy electron flux is expected to remain mostly at background levels through this period, with the Active (1e8 integrated pfu) fluence threshold not expected to be reached.

Figure 1. Solar Analysis Valid 09/1930UTC



Key: Filament — , Prominence — , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α - β - $\beta\gamma$ - $\beta\gamma\delta$ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

No anticipated Earth-directed CMEs feature in the forecast.

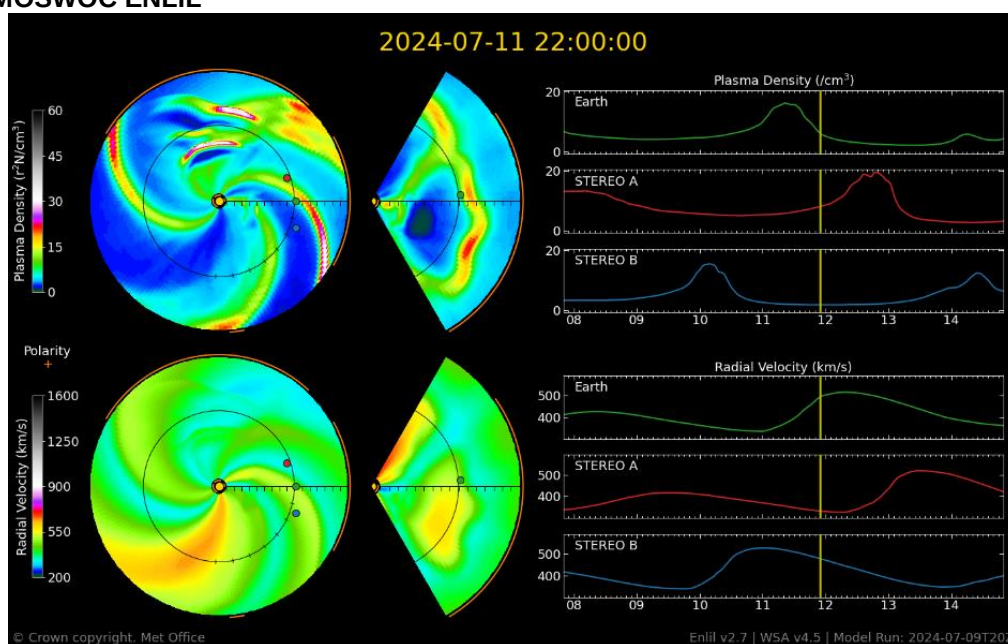
The solar wind should start at slow-ambient levels on day 1 (10 Jun). Two successive negative coronal holes in the southwest may bring slightly elevated or perhaps briefly elevated wind speeds later on day 1 until early day 3 (10-12 Jul). Significant geomagnetic activity from either of these features is considered unlikely due to their ill-defined appearance and Earth's proximity to the solstice.

A large, positive coronal hole (CH52/+) is currently transiting across centre disk in the northern hemisphere. This coronal hole is likely to connect with Earth later on day 3 or on day 4 (12-13 Jul), with wind speeds expected to reach elevated levels, perhaps around 500-600 km/s. This feature is dark in appearance and well defined alluding to the fast wind emanating from this coronal hole to be the most significant of any coronal holes currently on the disk.

Geomagnetic activity is expected to be mainly Quiet to Unsettled through the period. There is a Slight Chance of G1/Minor storm intervals days 1-2 (10-11 Jul), this then increasing to a Chance by days 3 and 4 (12-13 Jul) due to successive coronal hole fast wind enhancements.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	5	5	30	30
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: MOSWOC ENLIL



Radio Blackouts - X-Ray Flares:

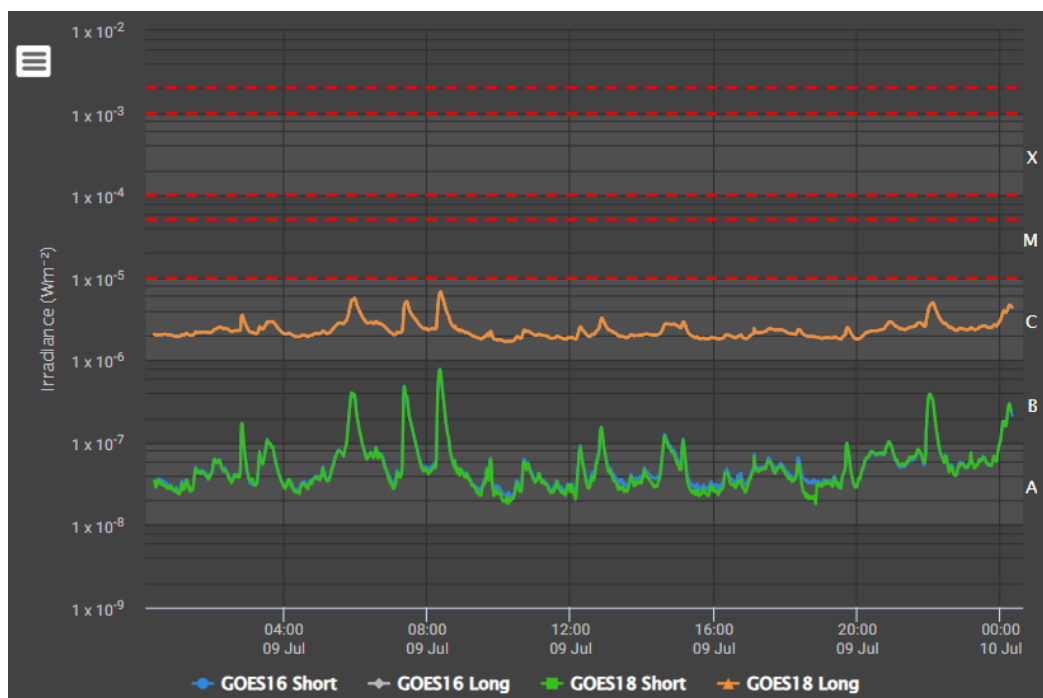
Solar activity is Low with baseline and peak X-ray flux all contained within C-class over the past 24hrs.

There are seven numbered and five as yet unnumbered regions on the disc. AR3738 in the southeast is by far the largest and most complex region on the disc, showing a continued growth trend in penumbral area and beta-gamma magnetic configuration. AR3743 also in the southeast but closer to the limb, is showing a slight growth trend in penumbral extent but appears relatively simple. There are four as yet unnumbered regions near the eastern limb, all of which appear simple, with the rest of the numbered and unnumbered regions on the disk also appearing small and magnetically simple.

There is a chance of isolated M-class flares, most likely from AR3738.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	40	40	40	40
Very Active	R3 to R5 X Class	No	5	5	5	5

Figure 3: 24 hour X-ray trace



Solar Radiation Storms - (High Energy Protons):

High energy proton flux at GOES18 is at background levels. It is most likely to remain that way, but with a slight chance of exceeding the S1/Minor radiation storm threshold should any larger flares occur, mainly from AR3738. Considering the region still resides in the southeast disc, it is still in an unfavourable location for significant proton enhancements to be detected at Earth following any notable flares. As the region rotates towards the southwest, the probability of exceeding S1 increases slightly, but still remains low.

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	5	5	5	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)

High Energy Electrons Event (≥ 2MeV):

High energy electron flux recorded at GOES16 has been at mostly background levels and is expected to remain that way through the forecast period. Later in the period, the arrival of coronal hole fast winds may serve to suppress and charge the Van Allen belts, perhaps leading to a rise in flux beyond this forecast period. MOSWOC REFM output is considered good guidance, with a generally flat trend indicated through the period, well below the Active 1e8 integrated flux threshold.

GEO Electron Environment	Level (cm ⁻² sr ⁻¹ day ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ 1x10 ⁸	No	1	1	1	1
Very Active	≥ 2 MeV ≥ 1x10 ⁹	No	1	1	1	1

Figure 5: REFM integrated flux observations/forecast/recurrence.

